

7. ON CARPENTERIA AND DUJARDINIA, TWO GENERA OF A NEW FORM OF PROTOZOA WITH ATTACHED MULTILOCULAR SHELLS FILLED WITH SPONGE, APPARENTLY INTERMEDIATE BETWEEN RHIZOPODA AND PORIFERA. BY DR. J. E. GRAY, F.R.S. ETC.

Many years ago I observed on some specimens of *Cardita variegata*, which Mr. J. Ritchie, the late Consul of Tripoli, had collected at Marseilles and sent to the British Museum, some specimens of a parasitic shell which resembled a *Balanus* in shape, but when more carefully examined were evidently not formed in the same manner as the shells of that class of animals; but as they were not in a good condition, it was not easy to decide from what animal they derived their origin.

Mr. Cuming some years later, when he transmitted his collection of Cirripedes to Mr. Dawson for his examination, sent with them some shelly bodies attached to the surface of a *Porites* Coral, and different kinds of shells, as *Pecten* and *Cardita*, which that naturalist returned to Mr. Cuming as "not Cirripede," on which Mr. Cuming brought them to the British Museum, requesting me to examine and describe them. These specimens brought to my mind the shells I had formerly received from Mr. Ritchie, and a casual examination of their form and structure at once showed me that they could not belong to a *Cirripede*; and as they presented some characters which were not to be observed in the Mediterranean specimens, a careful study of them led me to consider them as nearly allied to the Foraminiferous shell, but differing from any form of them with which I was acquainted, in being permanently attached to marine bodies; and they were so unlike, both in size and form, to any shells of the kind previously known, that several persons to whom I had expressed this opinion doubted their affinity to them. I therefore laid the specimens aside, in hopes that some other specimens might occur that would more fully elucidate their structure, and show their affinity to other known animals.

Though most of the naturalists to whom I have shown Mr. Cuming's specimens were inclined to regard them as a peculiar form of *Cirripede* shell, each examination of them tended to strengthen my original opinion, that they were a new form of *Foraminifera*; and this was further confirmed when I accidentally discovered that the cells were filled with a fleshy substance, in which bundles of simple sponge-like spicula were imbedded. This induced me to show them to Professor George Busk, and to inquire of him if he had ever seen any coral, or other natural body, to which they could be allied. He stated that he had not, unless they were the shells of a *Cirripede*; and on my expressing to him the opinion I had formed of their probable formation and affinity, he stated that it was not impossible that I was right, and that they might be an intermediate form of *Rhizopod* between a *Foraminiferous* shell and a *Sponge*, which is exactly the idea I had formed of their position,

considering them as a Sponge that was surrounded by and provided with a shelly case with a single terminal *oscule*.

Being desirous of obtaining other opinions on the subject before publishing any account of them, I transmitted the specimens to my friend Dr. William Carpenter, stating my belief that they were a new form of *Rhizopod* which had been mistaken by several naturalists for the shell of a *Cirripede*, giving him permission to take off and examine one of the specimens. He has most kindly sent me the following note.

University Hall, April 23, 1858.

MY DEAR SIR,

Your guess was a very sagacious one. The structure of the shell is most characteristically *Foraminiferous*, being riddled full of holes like a *Rotalia*. In the interior of the only specimen I have laid open was a brownish animal residuum full of *Sponge spicules*. Of course there is no great improbability in the idea that the Sponge was parasitical; but I am inclined to believe that this organism is the connecting link which I have long thought must exist between Sponges and Foraminifera, and that it is in fact a Sponge whose integuments have been consolidated into a Foraminiferous-like shell. You will find that the interior is not one single undivided cavity, but that it is loculated; and sections of the shell show a sort of areolation corresponding with the little bosses of the exterior.

I do not think that you will satisfactorily elucidate the organization of this creature, unless you have several sections made in different directions through the shell. I have limited myself to the one which you gave me the liberty to break up, with which I have done the best I could. I should like to have these (two) slides back again, and to have one or two perfect specimens, if you could spare me a corner of your block.

Yours very truly,
WILLIAM CARPENTER.

This account exactly agrees with my previous examination, as it was the knowledge that the shell was multilocular and minutely foraminated like the multilocular Foraminifera, which induced me to regard them as the case of a *Rhizopod*; and the knowledge that the cells were filled with a fleshy substance strengthened with spicula like certain sponges, which induced me to believe that they were also allied to the Porifera or Sponges; and in my note to Dr. Carpenter transmitted with the specimen on the 21st of April, 1858, I stated that "I regarded it as a *Rhizopod* of a new form; it is formed of a number of cells each ending in a terminal pore. The cells look like the valves of a Barnacle, and that is the reason that Mr. Cuming and my German friend think it is one; but the examination of the structure at once proves that it cannot be one."

Being strengthened by the opinion of Professor Busk and Dr. Carpenter, I have ventured to bring the subject before the Society; and I propose to form for the Philippine specimens a genus which I shall

name *Carpenteria*, after Dr. William Carpenter, who has paid so much attention and has been so successful in elucidating the structure and organization of these animals, and who is also the son of

CARPENTERIA.

Fig. 1.

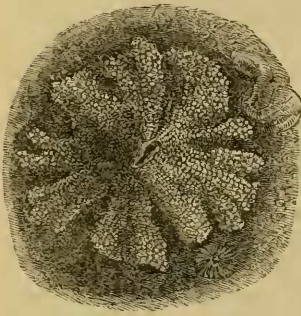


Fig. 2.

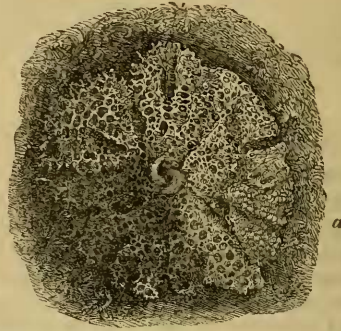


Fig. 1. Exterior surface complete.

Fig. 2. Partly eaten off by acid. a. Complete.

Fig. 4.

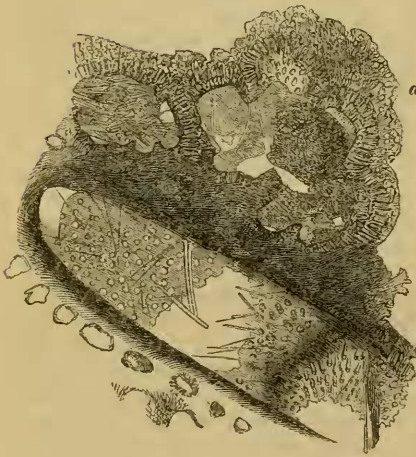


Fig. 3.



Fig. 3. Cross sunken cells, showing the spicula in the cells.

Fig. 4. Part of Fig. 3, more magnified. a. Outer parietes of cells.

my very dear friend Dr. Lant Carpenter, and the brother of Mr. P. P. Carpenter, to whom we are much indebted for the collection of Magellan Shells and the catalogue that accompanied it.

I shall merely give a slight description of the genus, sufficient to

distinguish it from other marine bodies, and send some of my specimens to Dr. Carpenter, in the hope that it will enable him to add a full account of its formation and structure to his paper on the Foraminiferous Shells which he is preparing for the Transactions of the Royal Society, assisted by the funds of that Institution.

1. CARPENTERIA.

Shell conical, attached by the broad base, formed of a series of elongated cells, each ending in a contracted mouth, piled one against another in a spiral manner, and with the aperture of the last cell at the apex in the centre of the acute cone. The substance of the cells is formed of a network of calcareous anastomosing ribs; the interspaces between the ribs are thin, calcareous, prominent externally, and pierced with numerous perforations. The cavity of the cells is filled with a fleshy sponge-like body, strengthened by numerous minute, simple, pin-shaped and fusiform smooth spicula placed in bundles.

C. BALANIFORMIS.

Hab. Philippine Islands, on *Porites*, *Cardita*, *Pecten* and other shells.

The conical shell is furnished with a single contracted aperture at the apex of the cone; as each cell is formed it closes the aperture of the preceding cell, so that only one is seen at the top of the cone. Some specimens show two or rarely three apertures at the tip of the cone; but this arises from the tip having been broken; these apertures are of a larger size and irregular form, very unlike the contracted uniform-shaped aperture of the last cell.

When the shell is worn, or partly destroyed by acid, the thin part between the network is destroyed, leaving only the calcareous ribs, which fill the greater part of the cavity, leaving a cavernous calcareous body somewhat like a sponge turned into stone.

A section of the parietes of the cells appeared to be formed of polyhedral plates separated from one another by a rather opaque line, as if formed by the union of the edges of the plates; and each plate is pierced with a number of uniform-sized, regularly disposed circular perforations, leaving a nearly uniform imperforated belt round the margin of each plate.

The specimens on the shells of *Cardita variegata* from the shores of the Mediterranean are so different in substance and structure from those found (on the same species of shell among others) on the shores of the Philippines, that I propose to form for them a second genus, named in honour of M. Felix Dujardin, the Professor of Biology and Dean of the Faculty of Sciences at Rennes, who first described the animal of the many-chambered microscopic shells, which had before been generally considered as the residence of Cephalopods! the most complicated organized mollusca, instead of the most simply organized animal.

2. DUJARDINIA.

Having the same external appearance and form as the preceding genus; that is, formed of cells aggregated together in a spiral form, the last cell being furnished with an apical opening; but the cells appear to have a simple cavity, and are formed of a thicker, harder, uniform shelly coat, which is very closely and uniformly pierced all over with very numerous, minute, equal-sized parallel pores. The cavity of the cell —? in the imperfect specimen which I have been able to examine, is simple; but then it has evidently been well-washed, probably with acid.

DUJARDINIA MEDITERRANEA.

Hab. Mediterranean; Marseilles, on *Cardita variegata* (J. Ritche, Esq. 1817).

These genera appear to me to form a distinct group of *Rhizopoda*, which may be called *Fenestrifera*, which is characterized by the animal being always attached to marine bodies, and the cellular body of the animal being strengthened with spicula and enclosed in a calcareous cell furnished with a single contracted aperture and pierced with numerous foramens or tubes.

These shelly bodies differ from all the shells of *Rhizopods* hitherto known, in being attached, and in the form, structure, and disposition of the cells, which (should the existence of spicula on the body prove a peculiarity of the genus *Carpenteria*, where alone it has been observed) is sufficient to form a group distinct from the other *Rhizopods*.

The existence of these spicula shows that the genus *Carpenteria*, and probably all the group, forms the passage between the *Porifera* and *Rhizopods*, which has been long suspected to exist, but has not before been described.

On the Mediterranean specimens of *Cardita variegata* there is intermixed with the *Dujardinia* a species of *Lepralia*, the anomalous *Polytrema miniacum*, which is formed of numerous layers, one deposited on the other, each formed of a calcareous network, with small equal hexangular interspaces, undefined patches of a crust formed of rough calcareous cells placed side by side like the cells of a *Lepralia*, but much more unequal in size and irregular in form than the cells usually found in that genus. The parietes of these cells are pierced with numerous equal-sized minute pores like the foramens of *Foraminifera*, the whole substance of the cell being apparently formed of numerous short shelly tubes placed parallel side by side. The cells are furnished with a small roundish hole at one of their extremities, which is often hid by the convexity of the other cell.

This may be a peculiar genus of *Lepraliadae* allied by my genus *Cribrillina* (Cat. Brit. Radiata, pp. 116, 147), which has "foraminiferous cells," as Professor Busk calls them; or it may prove to be another form of *Foraminifera*. If the former, the form of the cells

